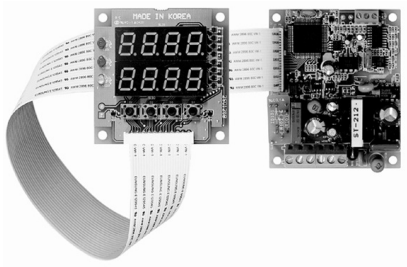
Autonics

BOARD TYPE TEMPERATURE CONTROLLER

TB42 SERIES

INSTRUCTION MAUAL



Thank you for choosing our Autonics product.
Please read the following safety considerations before use.

■ Safety Considerations

※Please observe all safety considerations for safe and proper product operation to avoid hazards.

※Safety considerations are categorized as follows.
⚠**Warning** Failure to follow these instructions may result in serious injury or death.
⚠**Caution** Failure to follow these instructions may result in personal injury or product damage.

※The symbols used on the product and instruction manual represent the following
⚠ symbol represents caution due to special circumstances in which hazards may occur.

⚠ Warning

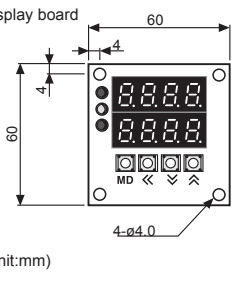
1. **Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)**
   Failure to follow this instruction may result in fire, personal injury, or economic loss.
2. **Install on a device panel to use.**
   Failure to follow this instruction may result in electric shock or fire.
3. **Do not connect, repair, or inspect the unit while connected to a power source.**
   Failure to follow this instruction may result in electric shock or fire.
4. **Check 'Connections' before wiring.**
   Failure to follow this instruction may result in fire.
5. **Do not disassemble or modify the unit.**
   Failure to follow this instruction may result in electric shock or fire.

⚠ Caution

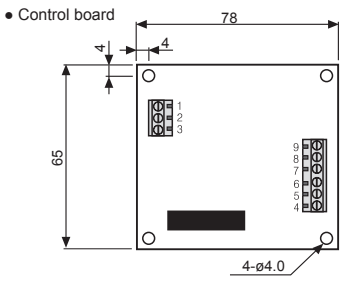
1. **When connecting the power input and relay output, use AWG 20(0.50mm²) cable or over, and connecting the sensor input and communication cable without dedicated cable, use AWG 28~16 cable.**
   Failure to follow this instruction may result in fire or malfunction due to contact failure.
2. **Use the unit within the rated specifications.**
   Failure to follow this instruction may result in fire or product damage.
3. **Use dry cloth to clean the unit, and do not use water or organic solvent.**
   Failure to follow this instruction may result in electric shock or fire.
4. **Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
   Failure to follow this instruction may result in fire or explosion.
5. **Keep metal chip, dust, and wire residue from flowing into the unit.**
   Failure to follow this instruction may result in fire or product damage.

■ Dimensions

● Display board

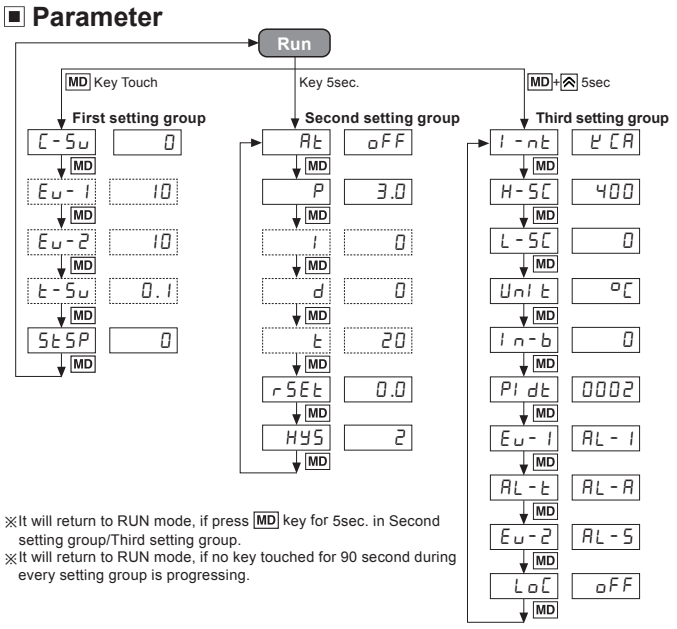


● Control board



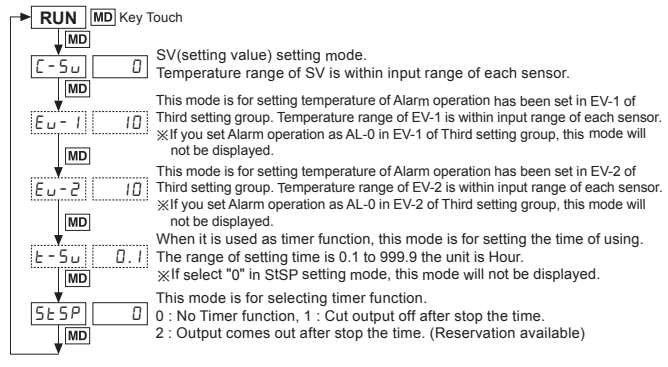
(Unit:mm)

■ Parameter



※It will return to RUN mode, if press MD key for 5sec. in Second setting group/Third setting group.
※It will return to RUN mode, if no key touched for 90 second during every setting group is progressing.

■ Flow chart for first setting group



SV(setting value) setting mode.
Temperature range of SV is within input range of each sensor.

This mode is for setting temperature of Alarm operation has been set in EV-1 of Third setting group. Temperature range of EV-1 is within input range of each sensor.
※If you set Alarm operation as AL-0 in EV-1 of Third setting group, this mode will not be displayed.

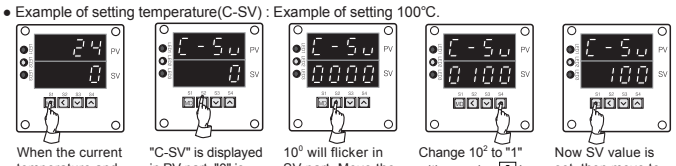
This mode is for setting temperature of Alarm operation has been set in EV-2 of Third setting group. Temperature range of EV-2 is within input range of each sensor.
※If you set Alarm operation as AL-0 in EV-2 of Third setting group, this mode will not be displayed.

When it is used as timer function, this mode is for setting the time of using.
The range of setting time is 0.1 to 999.9 the unit is Hour.
※If select "0" in StSP setting mode, this mode will not be displayed.

This mode is for selecting timer function.
0 : No Timer function, 1 : Cut output off after stop the time.
2 : Output comes out after stop the time. (Reservation available)

※Once enter into setting mode, the decimal point can be displayed, which is displayed by range of using temperature sensor but it doesn't influence on the function.
※The value in every setting mode is factory specification.
※Entering parameter is not available in transmission output type.

● Example of setting temperature(C-SV) : Example of setting 100℃.



When the current temperature and setting value are displayed, press MD key.

"C-SV" is displayed in PV part, "0" is displayed in SV part. Then press ≪ key.

10^0 will flicker in SV part. Move the digit to set by press ≪ key two times in order to set 100℃.

Change 10^2 to "1" with pressing ≪ key, then press MD key.

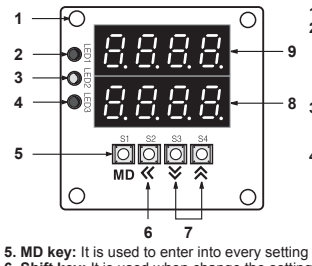
Now SV value is set, then move to EV-1 by pressing MD key again.

※**The above specifications are subject to change and some models may be discontinued without notice.**
※**Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).**

■ Specifications

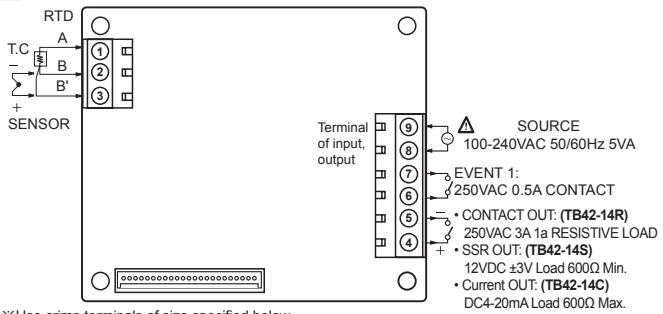
Model		TB42
Power supply		100-240VAC~ 50/60Hz(90 to 110% of rated voltage)
Allowable voltage range		90 to 110 of rated voltage
Power consumption		Approx. max. 5VA
Display method		7-segment (PV: green, SV: red) LED method
Character size (W×H)		8×10mm
Input sensor		• Thermocouple : K(CA), J(IC) (Tolerance of outer resistance is max. 100Ω) • RTD : Pt100Ω 3 wires(Allowable line resistance is max. 5Ω per a wire)
Control method		• ON/OFF control(Hysteresis is adjustable) • P, PI, PD, PIDF, PIDS
Control output		• Relay contact output:250VAC~ 3A 1a • SSR output:12VDC⎓±3V Load 600Ω min. • Current output:4-20mADC, Load 600Ω max.
Retransmission output		4-20mADC, Load 600Ω max. for PV
Sub output		• EVENT 1 output : Relay contact output(250VAC~ 0.5A 1a) • EVENT 2 output : OK monitor operation display by LED
Setting method		Setting by front push buttons
Display accuracy		±0.3% rdg based on F·S or 3℃ Max.
Adjustment sensitivity		Adjustable 1 to 100℃(0.1 to 100.0℃) at ON / OFF control
Proportional band(P)		0.0 ~ 100.0%
Integral time(I)		0 ~ 3600sec
Derivative time(D)		0 ~ 3600sec
Control cycle(T)		1 ~ 120sec
Sampling time		0.5sec. fixed
Relay life cycle	Main output	Mechanical:Min.10,000,000 times Electrical:Min.100,000 times(250VAC 3A resistive load)
	Sub output	Mechanical:Min.20,000,000 times Electrical:Min.200,000 times(250VAC 0.5A resistive load)
Memory retention		10 years
Environ -ment	Ambient temperature	-10 ~ 50℃, Storage: -20 ~ 60℃
	Ambient humidity	35 ~ 85%RH

■ Front panel identification

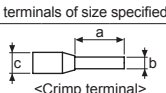


1. **Mounting hole**
2. **Main output operation display LED:**
   It indicates the operation status of control output and displayed on "LED 1". But when it is current output (TB42-14C) or Retransmission output(TB42-14N), "LED 1" doesn't operate. (LED indication is OFF)
3. **EVENT 1 output operation display LED:**
   It indicates the operating status of alarm output and displayed on "LED 2".
4. **O.K monitor operation display LED:**
   It indicates the operating status of alarm output and displayed on "LED 3".
   After setting alarm output in EVENT 2, if execute autotuning, O.K monitor operation will be displayed after AT function.
5. **MD key:** It is used to enter into every setting group or move to other setting mode.
6. **Shift key:** It is used when change the setting value or move to digit at setting mode.
7. **Up/Down key:** It is used when change the setting value or select setting function.
8. **C-SV display:** The setting temperature is displayed in red. But when timer function is used, the setting time will be displayed, if time function is OFF, it will return to the setting temperature.
9. **PV display:** It displays measured temperature in green.

■ Connections



※Use crimp terminals of size specified below.



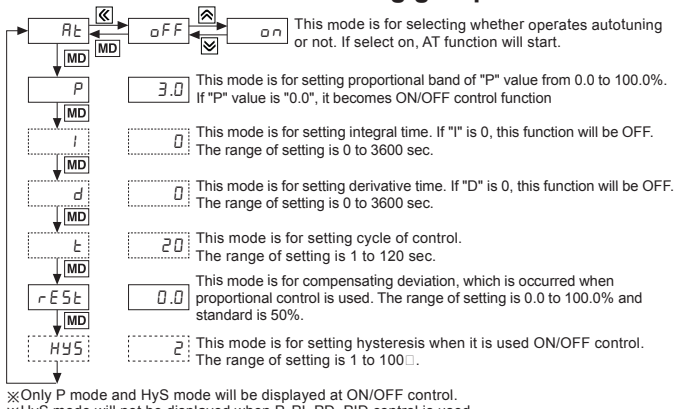
<Crimp terminal> (unit: mm)

Terminal number	a	b	c
1 to 3	4 to 5	Max. 1.3	Max. 3.3
4 to 9	6	Max. 2.1	Max. 4.2

■ Alarm output

Mode	Operation	Function
AL-A	General Alarm	No optional alarm output.
AL-b	Alarm Latch	When alarm output turns on once, the output will keep ON continuously.
AL-C	Standby Alarm	It doesn't output at first operation. (When it reaches to first object value)
AL-d	Alarm Latch & Standby Alarm	It operates Alarm Latch & Standby Alarm at the same time.

■ Flow chart for second setting group



This mode is for selecting whether operates autotuning or not. If select on, AT function will start.

This mode is for setting proportional band of "P" value from 0.0 to 100.0%.
If "P" value is "0.0", it becomes ON/OFF control function

This mode is for setting integral time. If "I" is 0, this function will be OFF.
The range of setting is 0 to 3600 sec.

This mode is for setting derivative time. If "D" is 0, this function will be OFF.
The range of setting is 0 to 3600 sec.

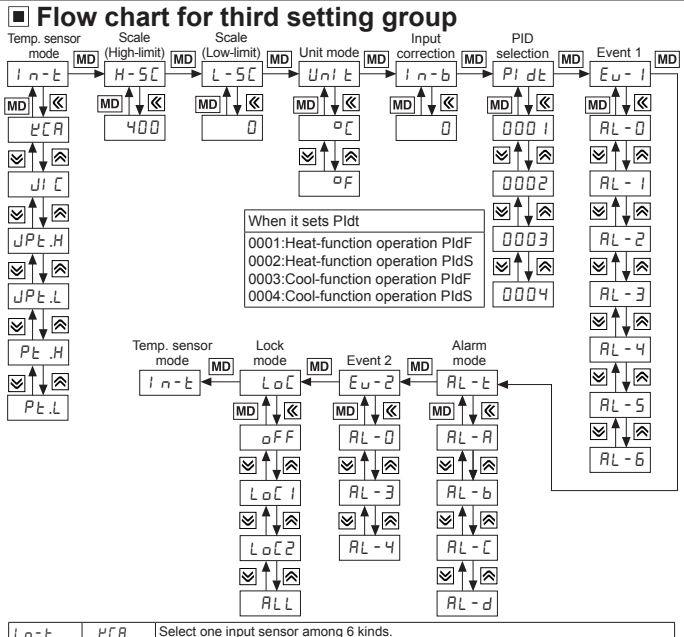
This mode is for setting cycle of control.
The range of setting is 1 to 120 sec.

This mode is for compensating deviation, which is occurred when proportional control is used. The range of setting is 0.0 to 100.0% and standard is 50%.

This mode is for setting hysteresis when it is used ON/OFF control.
The range of setting is 1 to 100□.

※Only P mode and HyS mode will be displayed at ON/OFF control.
※HyS mode will not be displayed when P, PI, PD, PID control is used.
※Values in every setting mode is factory specification.
※Return to RUN mode in all modes when pushing a MD key for 5sec.
※ Entering parameter is not available in transmission output type.

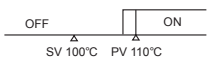
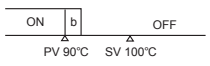
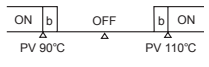
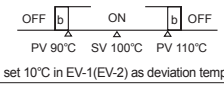
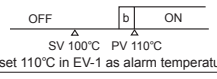
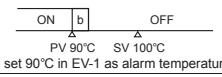
■ Flow chart for third setting group



In-t	ytCA	Select one input sensor among 6 kinds.
H-SC	400	Setting High-limit of temperature. Setting range is within input range of each sensor.
L-SC	0	Setting Low-limit of temperature. Setting range is within input range of each sensor.
Unit	°C	Setting the unit of temperature and select between ℃ or ℉.
In-b	0	It is compensating the allowance occurred in input sensor. The range of setting is -50 to 50℃(Decimal type : -50.0 to 50.0℃).
PIdt	2	Select PID control type among 4 kinds.
Eu-1	AL-1	Select Alarm output function of EVENT1 among 7 kinds.
AL-t	AL-A	Select Alarm output option function among 4 kinds.
Eu-2	AL-5	Select Alarm output function of EVENT2 among 3 kinds.
LoC	oFF	Set whether it is locked or not of setting value among 4 kinds.

※It will return to RUN Mode by pressing MD +≪ Key for 5second in each setting Mode
※When SV is flickered by pressing ≪ key, it is able to set the value by pressing ≪, ≫ key then press MD key and move to other Mode by pressing MD key again.
※If no key touched for 90sec. in each setting mode, it will return to RUN Mode.

■ Operation chart for alarm output

AL-0	—	No alarm output.
AL-1	 ※When set 10℃ in EV-1 as deviation temperature.	■ Deviation High-limit alarm If deviation between PV and SV is occurring higher than deviation temperature setting value, the output will be ON. The deviation temperature is set in EV-1 of first setting group.
AL-2	 ※When set 10℃ in EV-1 as deviation temperature.	■ Deviation Low-limit alarm If deviation between PV and SV is occurring lower than deviation temperature setting value, the output will be ON. The deviation temperature is set in EV-1 of first setting group.
AL-3	 ※When set 10℃ in EV-1(EV-2) as deviation temperature.	■ Deviation High/Low-limit alarm If deviation between PV and SV is higher or lower than deviation temperature setting value, the output will be ON. The deviation temperature is set in EV-1 or EV-2 of first setting group.
AL-4	 ※When set 10℃ in EV-1(EV-2) as deviation temperature.	■ Deviation High/Low-limit reverse alarm If deviation between PV and SV is higher or lower than deviation temperature setting value, the output will be OFF. The deviation temperature is set in EV-1 or EV-2 of first setting group.
AL-5	 ※When set 110℃ in EV-1 as alarm temperature.	■ The absolute value High-limit alarm If PV is equal or higher than alarm temperature setting value, the output will be ON. The deviation temperature is set in EV-1 of first setting group.
AL-6	 ※When set 90℃ in EV-1 as alarm temperature.	■ The absolute value Low-limit alarm If PV is equal or lower than alarm temperature setting value, the output will be ON. The alarm temperature is set in EV-1 of first setting group.

※ "b" means fixed 2℃ as interval between ON and OFF when alarm output is operating.

■ Functions

◎ **EVENT function**
- This function can execute as main control output and sub function as well.
- EVENT1 output is relay contact consisted of 250VAC and 0.5A 1a.
  There are 7 setting mode include deviation alarm and absolute alarm.
  The operation of EVENT1 output is displayed on LED2 at front.
- There is no terminals for EVENT2 output, it is operating as O.K monitor operation at AL-3, AL-4 displayed in LED 3 at front.

◎ **Autotuning function**
PID Autotuning function is automatically to measure thermal characteristics and response of the control object and then execute its value under high response & stability after calculating the time constant of PID required to control optimum temperature. When AT function is started, LED3 will flicker and when LED3 is OFF this operation will stop.

◎ **Dual PID control function**
One is that PV is reached at SV with fast response speed, but a little of overshoot is occurred, the other is that PV is reached at SV with slow response speed, but overshoot will be minimized.
1)PIDF(PID fast) : This mode is applied at the machines or systems which requite stop fast response speed, and allowable a little overshoot which requite.
2)PIDS(PID slow) : This mode is applied at the machine which overshoot must not be occurred, because the fire can be and allowable low response time.

◎ **Retransmission output(PV)**
This function is to transmit the current value(PV) to external equipment such as PC or recorder etc. the output is 4-20mADC and cannot be used with control output at the same time. It will output 20mA, when PV reaches to the temperature in H-SC, and output 4mA, when PV reaches to the temperature in L-SC.
Resolution is 16,000 division. (TB42-14N)

◎ **Error indication**
If an error is occurred while the controller is operating, it will be displayed as follow.
1)"LLLL" is flickering when measured input temperature is lower than input range of the sensor.
2)"HHHH" is flickering when measured input temperature is higher than input range of the sensor.
3)"oPEn" is flickering when the input sensor is not connected or its wire is cut.

◎ **Manual reset(rESt)**
Proportional control has an offset because rising time is not the same as falling time, even if the unit operates normally. This function is to correct offset.

◎ **Lock function**
Setting value cannot be changed by unauthorized person. There are 4kinds of lock mode in this unit.
1)"OFF" : All modes can be changed.
2)"Loc1" : All modes except Second setting group, Third setting group.
3)"Loc2" : All modes except C-SV.
4)"All" : All modes can not be changed.

◎ **Timer function(t-Sv)**
- There is no output terminal in this function, it controls main output by setting of Timer function.
- Timer function
  ①When set "0000" in StSP mode : It will not be the Timer function.
  In this case it doesn't display t-SV mode.
  ②When set "0001" in StSP mode : It is controlling temperature during the time is set in t-SV.
  Ex)If set 5.0 to t-SV, it will stop after controlling for 5 hours.
  ③When set "0002" in StSP mode : After set the time in "t-SV", it starts to control temperature.
  Ex)If set 5.0 to t-SV, it will start to control after 5 hours.
- When need to stop timer during operation, move to StSP mode and set "0000".
- When timer function is used, the time has been set in "t-SV" will be displayed in SV display of RUN mode.

■ Input specification and temperature range

Input sensor	Display	Selectable temperature range ℃	Selectable temperature range ℉
K(CA)	ytCA	-100 ~ 1300 ℃	-148 ~ 2372 ℉
J(IC)	JIC	0 ~ 800 ℃	32 ~ 1472 ℉
JPtH	JPt.H	0 ~ 500 ℃	32 ~ 932 ℉
JPtL	JPt.L	-199.9 ~ 199.9 ℃	-199.9 ~ 392.0 ℉
DPtH	dPt.H	0 ~ 500 ℃	32 ~ 932 ℉
DPtL	dPt.L	-199.9 ~ 199.9 ℃	-199.9 ~ 392.0 ℉

■ Factory default

■ First setting group

C-Su	0
Eu-1	10
Eu-2	10
StSP	0

■ Second setting group

At	oFF
P	3.0
I	0
d	0
t	20
rESt	0.0

■ Third setting group

In-t	ytCA
H-SC	400
L-SC	0
Unit	°C
In-b	0
PIdt	2
Eu-1	AL-1
AL-t	AL-2
Eu-2	AL-4
LoC	oFF

※When it is SSR output, control cycle(t) of second setting group is 2.

■ Cautions during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
2. Check the polarity of the terminals before wiring the temperature sensor.
   For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length.
   For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire.
3. Keep away from high voltage lines or power lines to prevent inductive noise.
   In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.
   Do not use near the equipment which generates strong magnetic force or high frequency noise.
4. Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power.
5. Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.
6. Make a required space around the unit for radiation of heat.
   For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
7. Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
8. Do not wire to terminals which are not used.
9. This unit may be used in the following environments.
   ①Indoors (in the environment condition rated in 'Specifications') ②Altitude max. 2,000m
   ③Pollution degree 2 ④Installation category II

■ Major Products

■ Photoelectric Sensors
■ Fiber Optic Sensors
■ Door Sensors
■ Door Side Sensors
■ Area Sensors
■ Proximity Sensors
■ Pressure Sensors
■ Rotary Encoders
■ Connector/Sockets
■ Switching Mode Power Supplies
■ Control Switches/Lamps/Buzzers
■ I/O Terminal Blocks & Cables
■ Stepper Motors/Drivers/Motion Controllers
■ Graphic/Logic Panels
■ Field Network Devices
■ Laser Marking System (Fiber, Co_2, Nd: YAG)
■ Laser Welding/Cutting System
■ Temperature Controllers
■ Temperature/Humidity Transducers
■ SSRs/Power Controllers
■ Counters
■ Timers
■ Panel Meters
■ Tachometer/Pulse (Rate) Meters
■ Display Units
■ Sensor Controllers

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